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10/608,639	06/30/2003	Myung-Ah Kang	SEC.1051	8355

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EXAMINER	
RUGGLES, JOHN S	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/608,639	KANG ET AL.	
	Examiner	Art Unit	
	John Ruggles	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-12 and 14-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-12 and 14-20* is/are rejected.

7)☒ Claim(s) *2-12 and 14-20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 August 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination (RCE) under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences (BPAI), but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicants' submission filed on 6/21/07 has been entered.

Response to Amendment

In the 6/21/07 current RCE amendment filed by Applicants, claims 1 and 13 were previously cancelled, claims 2-6, 12, 15, 17-20 remain as previously presented, *claims 7, 11, 14, and 16* are *currently amended*, and claims 8-10 remain as original. Therefore, only claims 2-12 and 14-20 remain under consideration.

Revised objections to the drawings, specification, and claims are presented below.

New rejections of the claims under the second paragraph of 35 USC 112 set forth below are in response to the current amendment.

The previous art rejections of the claims under 35 USC 102/103 and 103 are revised below, in response to the current amendment and accompanying remarks.

Responses to Applicants' current arguments are presented after the first rejection or objection to which they are directed. Rejections or objections of the previous Office action not found below are withdrawn in view of the current RCE amendment and accompanying remarks.

Drawings

(i) The drawings (e.g., Figure 3A, Figures 5A-5C, etc.) are objected to as failing to comply with 37 CFR 1.84, because they are inverted with respect to the corresponding descriptions thereof in the specification (e.g., at paragraphs [0090], [0120], etc.) and the drawings are also inverted with respect to the corresponding instant claim(s) (e.g., so that the trench *upper* surface in the drawings is described to be the trench "bottom" surface as recited in line 3 of currently amended claims 14 and 16, etc.). Note that 37 CFR 1.84(h) specifically indicates that the drawings should preferably be presented in an upright position. However, since Applicants have described these drawings in the specification and corresponding claims with directional language, Applicants must at least be consistent therewith by either (A) supplying corrected drawings that fully correspond to the directional language in the specification and claims or (B) amending the specification and claims at all applicable occurrences to correspond with the orientation of all the features that are shown in the drawings.

(ii) The drawings are also objected to under 37 CFR 1.83(a), because Figure 4 does not extend above auxiliary pattern line widths of 150 nm. The drawings must show every feature of the invention specified in the claims. Therefore, the *entire range for the auxiliary pattern line widths from 30 nm to 200 nm (as recited by instant claims 6, 11, and 20) must be shown* or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing

should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to, at least because of the following informalities: (5) in paragraph [0025] line 3, "quartz substrate 10" *must* be corrected to --quartz substrate [[10]] 11--, in order to be consistent with line 1 of this same paragraph and also to be consistent with prior art Figure 1A to which this paragraph refers; (6) in [0090] line 11, "exposure conditions should be designed for so that" should be shortened to --exposure conditions should be designed [[for]] so that--; and (7) in [0095] line 9 "patterned, i.e., regions C corresponding to sidewalls of the trench" should be changed to --patterned, [[i.e.,]] for example at region ~~regions~~ C in FIG. 3B, corresponding to sidewalls of the trench--.

Appropriate correction is required.

Claim Objections

(1) Claims 2-6 and 14-15 are objected to under 37 CFR 1.75(c) and (g), as being of improper dependent form for failing to further limit the subject matter of a previous claim and also because the least restrictive claim (e.g., independent claim 14, etc.) should be presented with the lowest claim number, and all dependent claims therefrom should be grouped together with the claim or claims to which they refer. Applicants are required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form and number sequence, or rewrite the claim(s) in independent form in proper number order. Claims 2-6 depend from claim 14, so these claims must be corrected as indicated above. Claim 15 depends from claim 14 and is therefore objected to as well, due to its dependency on claim 14.

Claims 2-12 and 14-20 are also objected to, at least because of the following informalities: (2) in each of (a) claim 7 line 17 (last line), (b) claim 14 line 10 (last line), and (c) claim 16 line 10 (last line), the language "not formed at areas corresponding to the auxiliary pattern" should be changed to --not formed at an area ~~areas~~ corresponding to the auxiliary pattern--, in order to be consistent with other language in each claim of all three occurrences; and (3) also in claim 16 line 10 (last line), "are" should be corrected to --[[are]] is--. Claims 2-6 and 15 depend from claim 14, claims 8-12 depend from claim 7, and claims 17-20 depend from claim 16. Even though these changes are the interpretations of these claims used for the purpose of this Office action, appropriate correction of these claims is still required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 2-12 and 14-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter, which applicant regards as the invention.

In each of (1) claim 7 lines 14-17, (2) claim 14 lines 7-10, and (3) claim 16 lines 7-10, the currently amended phrase "the mask is used to pattern a photoresist layer by passing light therethrough" is unclear about whether the light is passed (A) through the mask or (B) through the photoresist. However, for the purpose of this Office action, this phrase has been interpreted in each occurrence of claims 7, 14, and 16 to mean --the mask is used for passing light therethrough to pattern a photoresist layer ~~by passing light therethrough~~--, in accordance with (A) above (to produce a light intensity curve B2, as shown by instant Figure 3B, which is described in the specification at paragraph [0095]). It is also unclear how this intended use language further limits the actual structure of the claimed phase edge phase shift mask (PEPSM) or the claimed method of fabricating the PEPSM. Accordingly, for the purpose of this Office action and in order to expedite prosecution of this application, the above intended use language in claims 7, 14, and 16 has not been considered as further limiting the actual claimed PEPSM structure or method of fabricating the PEPSM. Claims 8-12 depend from claim 7, claims 2-6 and 15 depend from claim 14, and claims 17-20 depend from claim 16.

(4) In claim 11 lines 1-3, the phrase "said etching a portion of the material comprises forming an auxiliary pattern having a line width of 30 nm to 200 nm on at least one of said first and second surfaces" lacks proper antecedent basis and is unclear about whether the singular auxiliary pattern is either (C) the same or (D) a different auxiliary pattern from that recited previously by claim 7 line 10 (as interpreted above), from which claim 11 depends. This phrase

should be amended to correspond with the interpretation of claim 7 line 10 (set forth above) as follows: --said etching [[a]] ~~portion of~~ the layer of material comprises forming [[an]] the auxiliary pattern having a line width of 30 nm to 200 nm on at least one of said first and second surfaces--.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-5, 7-10, 12, and 14-15 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ham (US 5,567,552).

Ham teaches a (phase edge) phase shift mask (PEPSM, Figure 2, c2/L60-63, c4/L3-14) and a method of fabricating such a PEPSM (abstract, Figures 1A-1F, c2/L13-59). As shown in front page Figure 2, the PEPSM 10 has a transparent quartz substrate 1 in which is etched grooves or trenches 3 of width B constituting 180° phase shift regions separated by an unetched transparent 0° region of width A, wherein each trench 3 has a sidewall surface 3A and a bottom surface extending therefrom. An opaque chrome (Cr) auxiliary pattern 5B is formed at the center

of each trench bottom surface by coating Cr and etching back to leave only the desired portion of Cr. When this PEPSM is used for passing light therethrough to pattern a photoresist layer, the auxiliary pattern 5B is shown to reduce only a portion of an intensity of light (e.g., across the entire PEPSM, across the bottom of each trench having a width B, across the width of each auxiliary pattern 5B, etc., as illustrated in Figure 2 of Ham). Therefore, Ham's PEPSM is considered to be inherently capable and fully suitable for forming a photoresist pattern at an area corresponding to an edge of each trench while not forming a photoresist pattern at an area corresponding to a Cr opaque auxiliary pattern (which specifically reads on the PEPSM and corresponding method of fabrication recited by *instant claims 2, 4-5, 7, 9-10, 12, and 14-15*; and further encompasses the PEPSM and corresponding method of fabrication recited by *instant claims 3 and 8* for an auxiliary pattern of optical interference material that is opaque).

On page 6 in the remarks section of the current RCE amendment, Applicants rely on the current claim amendments for intended use of the instant PEPSM structure, rather than relying on actual structure of the PEPSM or its method of manufacture as actually recited in the instant claims. Applicants also argue differences between the intended light intensity of instant Figure 3B as compared to that shown by Ham's Figure 2.

In response, it is conceded that the intensity of light curve illustrated by instant Figure 3B is different from that illustrated by Ham's Figure 2. However, it is not instant Figure 3B that stands rejected over Ham, but rather the actual recitations of the instant claims that remain rejected over Ham. In the phase edge phase shift mask (PEPSM) of instant claim 14 and the method of fabricating the PEPSM of instant claim 7, the actual mask structure and materials, as well as the method of making this PEPSM, are both met by Ham (as described throughout

prosecution and again set forth above). In fact, Applicants have not disputed the similarity of Ham's PEPSM actual structure, materials, and steps of forming the mask to those of the instant claims. Therefore, since Ham's PEPSM (and method of fabricating it) show the same or very similar actual structure and materials as are recited by the instant claims, Ham's PEPSM would have been inherently capable of performing the actual recitations of function and intended use of the instant claims. See MPEP § 2112 and *In re Schreiber*, 128 F.3d 1473, 44 USPQ2d 1429 (Fed. Cir. 1997).

The only argument pursued in the remarks section of the current RCE amendment by Applicants is what they contend to be a difference in function or intended use for the instantly claimed PEPSM over that of Ham. A recitation directed to the manner in which a claimed apparatus or mask structure is intended to be used does not distinguish the claimed mask structure from that of the prior art (Ham), if the prior art has the capability to so perform. See MPEP § 2114 and *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).
As indicated above, the instant claims require that "when" the PEPSM "is used for passing light therethrough to pattern a photoresist layer" or a resist layer, "the auxiliary pattern reduces only *a portion of an intensity of the light*" (emphasis added), so that some kind of pattern is formed in the resist at "*an area* corresponding to an edge of the trench" (of the PEPSM, emphasis added), but is not formed at "*an area* corresponding to the auxiliary pattern" (of the PEPSM, emphasis added). This intended use as claimed does not specify exactly (a) how wide or how close to the edge of the mask trench the pattern "area" on the resist has to be aligned with the edge of the mask trench, (b) whether the pattern is formed in the resist by light intensity that is either above or below an exposure threshold of the resist as compared to the light intensity that is either below

or above the exposure threshold of the resist at the area corresponding to the auxiliary pattern on the PEPSM, (c) what kind of resist is used (e.g., positive or negative resist, etc.), nor (d) the strength of light intensity required to expose the resist (e.g., the exposure threshold of the resist, etc.).

Ham's Figure 2 illustrates that a higher light intensity is achieved through the PEPSM near the trench edge 3A (within "*an area* corresponding to an edge of the trench"), including an edge portion of each auxiliary pattern 5B, than the lower light intensity that is realized under the center portion or area of each opaque auxiliary pattern 5B (so that the auxiliary pattern reduces only *a portion of an intensity of the light*). Therefore, it would have been recognized by one or ordinary skill in the art that Ham's PEPSM would be inherently capable of forming a pattern in the resist at "*an area* corresponding to an edge of the trench" (of the PEPSM taught by Ham), while not forming a pattern in the resist at "*an area* corresponding to the auxiliary pattern" of this prior art PEPSM.

For at least the above reasons, it is still believed that the prior art PEPSM and method of making it taught by Ham would have been inherently capable of meeting the instant claim limitations as they are actually recited.

Claims 6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ham (US 5,567,552) in view of Randall et al. (US 2002/0094492).

While teaching the other aspects of *instant claims 6 and 11*, Ham does not specify the line width of the opaque Cr auxiliary pattern to be 30-200 nm.

However, Cr line widths on a PSM in the instant range of 30-200 nm are well known. For example, Randall et al. teach a method of double exposure and a PSM therefore having

orthogonal overlapping Cr regions (34, 36) that are each of critical dimension (CD) width (w_{34}, w_{36}) and that these CD width Cr regions are provided on both the binary (mask) **and the PSM(s)** (35, 33, emphasis added). These Cr region CD widths w_{34} and w_{36} are each specifically exemplified as being 0.2 μ (200 nm) wide (paragraph [0058] lines 4-6). Alternatively, a well-known "1X" mask having the same dimensions as those imaged on the resist for making a 0.16 μ (160 nm) wide gate electrode having a critical width includes a Cr opaque line width of 160 nm ([0004] L15-20, [0019] L7-11, [0038] L5-10,22-26, and [0055] L18-22). Furthermore, gate electrode line widths on the order of 0.15 μ (150 nm) are also contemplated ([0012] L24-27) for a corresponding PSM having a Cr opaque line width of 150 nm. It is desirable to fabricate integrated circuit device features that are as small and closely packed as possible to provide a high level of functionality and performance for the circuit, due to small feature sizes. The term "photomask" is used broadly, in reference to both 1X masks and reticles for various types of exposures [0004], [0038], as well as in reference to PSMs [0057].

It would have been obvious to one of ordinary skill in the art at the time of the invention for the PEPSM and the corresponding method of fabrication taught by Ham to have employed an opaque Cr auxiliary pattern having a well-known narrow line width (of e.g., 150-200 nm, etc. or smaller, reading on the instant line width of 30-200 nm), so that the PEPSM would have features that are as small and closely packed as possible to provide a high level of functionality and performance, as taught by Randall et al., for a product (e.g., circuit device, etc.) made by patterned exposure through this PEPSM. One of ordinary skill in the art would also recognize that narrower CD widths of opaque Cr patterns having proven utility on binary masks (e.g., the opaque Cr widths of 160nm or 150nm exemplified by Randall et al., etc., as discussed above)

would reasonably be expected to have similar beneficial utility on a PSM and would therefore have been obvious as the opaque Cr auxiliary patterns at the bottom of the PS trenches in the PEPSM structure taught by Ham, for the same reason as indicated above (*instant claims 6 and 11*).

Claims 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ham (US 5,567,552) in view of either Kamon (US 6,737,198) or Steinberg et al. (US 2002/0031711).

Ham does not specifically teach an additional opaque or optical interference Cr auxiliary pattern formed at the center of the unetched transparent 0° region of width A.

Kamon teaches alternative embodiments of a PSM having etched recessed phase shifters (PS) and relatively narrow light shading, opaque, or optical interference auxiliary patterns 111 centered either at the bottom of the etched PS recesses in the substrate 10 (Figure 21G, c17/L49 to c18/L16) or on top of raised portions of the substrate 10 (Figure 22E, c18/L17-36).

Steinberg et al. teach an alternative embodiment of a multi-level PSM in Figure 9(e) having raised transparent mesas or pedestals 902 on a transparent substrate 905 and patterned opaque metal (e.g., Cr, etc.) regions 906 on both the raised 902 and recessed 905 areas of the substrate (paragraphs [0047], [0081]).

It would have been obvious to one of ordinary skill in the art at the time of the invention for the PEPSM taught by Ham to have employed an additional opaque or optical interference Cr auxiliary pattern (as taught by either Kamon or Steinberg et al.) formed at the center of the unetched transparent 0° region of width A (as shown in Ham Figure 2). This would be for the same reason such an opaque or optical interference Cr auxiliary pattern was used at the center of each trench bottom surface (taught by Ham) so that when this combined PEPSM (taught by Ham

and either Kamon or Steinberg et al.) is used to pattern a photoresist layer, it would be inherently capable and fully suitable for forming a photoresist pattern at an area corresponding to an edge of each trench while not forming a photoresist pattern at an area corresponding to the Cr opaque auxiliary pattern or additional Cr opaque auxiliary pattern, each of which reduces only a portion of an intensity of the light passing through the combined PEPSM (this reads on the PEPSM recited by *instant claims 16 and 18-19* and further encompasses the PEPSM recited by *instant claim 17* for an auxiliary pattern of optical interference material that is opaque).

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ham (US 5,567,552) in view of either Kamon (US 6,737,198) or Steinberg et al. (US 2002/0031711), and further in view of Randall et al. (US 2002/0094492).

While teaching the other aspects of *instant claim 20*, Ham and either Kamon or Steinberg et al. do not specify the line width of the opaque Cr auxiliary pattern to be 30-200 nm.

The teachings of Randall et al. are discussed above.

It would have been obvious to one of ordinary skill in the art at the time of the invention for the PEPSM taught by Ham and either Kamon or Steinberg et al. to have employed an opaque Cr auxiliary pattern having a well-known narrow line width (of e.g., 150-200 nm, etc. or smaller, reading on the instant line width of 30-200 nm), so that the PEPSM would have features that are as small and closely packed as possible to provide a high level of functionality and performance, as taught by Randall et al., for a product (e.g., circuit device, etc.) made by patterned exposure through this PEPSM for forming a photoresist pattern at an area corresponding to an edge of each trench while not forming a photoresist pattern at an area corresponding to the Cr opaque auxiliary pattern having a well-known narrow line width (that reduces only a portion of an

intensity of light passing through the PEPSM). One of ordinary skill in the art would also recognize that narrower CD widths of opaque Cr patterns having proven utility on binary masks (e.g., the opaque Cr widths of 160nm or 150nm exemplified by Randall et al., etc., as discussed above) would reasonably be expected to have similar beneficial utility on a PSM and would therefore have been obvious as the opaque Cr auxiliary patterns at the bottom of the PS trenches in the PEPSM structure taught by Ham as well as the additional opaque or optical interference Cr auxiliary pattern (as taught by either Kamon or Steinberg et al.) formed at the center of the unetched transparent 0° region of width A (shown by Ham), for the same reason as indicated above (*instant claim 20*).

Response to Arguments

Applicants' arguments in the current RCE amendment with respect to claims 2-12 and 14-20 have been considered, but they are either moot or unpersuasive in view of the newly revised ground(s) of rejection and objection set forth above in this Office action.

Responses to Applicants' current arguments are presented after the first rejection or objection to which they are directed. Rejections or objections of the previous Office action not found above are withdrawn in view of the current RCE amendment and accompanying remarks.

Conclusion

The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure.

Misaka (US 6,703,168) teaches various PSM embodiments having isolated light-shielding and/or PS patterns either individually or in combination with each other, as well as comparisons of the relative light shielding properties of these patterns at various widths on a

PSM (title, abstract). Figures 5(c)-(e) show intensities for mask linewidths (L) of 60nm, 100nm, 160nm, respectively. Figure 5(e) shows an inverted dip in the lowest light intensity from a mask having a line width L = 160nm (of PS material 141 in the Figure 5(b) PSM as compared to the Figure 5(a) binary mask having light shielding or opaque material (Cr) of the same width, c11/L47-60, c17/L46 to c18/L35). This illustrates a comparison of width on the light shielding effect of Cr versus that of PS, which have the same effect at about L=130nm for 193nm wavelength light.

Myazaki et al. (US 6,048,647) teach a PSM and a method of manufacturing it (title). At least one embodiment of this PSM has a central auxiliary pattern 38 (of carbon (C) opaque material), as shown in front page Figure 30 (of which Figure 31 is a corresponding side view), to cancel or reduce side lobe light intensity that would lead to an unwanted exposure under this region of the PSM (abstract, c12/L39-51).

Salik et al. (US 5,916,711) teach various PSM patterns designed to improve resolution (e.g., by segmenting mask pattern features with at least one auxiliary pattern, etc., title, abstract). Figure 11(c) shows the intensity distribution resulting from exposure of a PSM having a single large feature, whereas Figure 11(f) shows the intensity distribution resulting from exposure of a PSM having a large feature that is segmented into multiple regions. Attenuation on the PSM can substitute for segmentation on the PSM (c9/L28-49).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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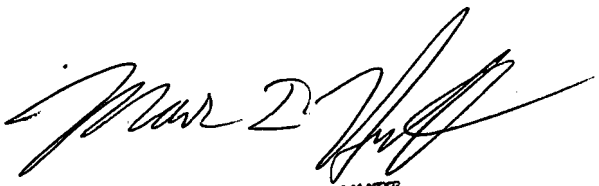

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